

## **VOLLEYBALL PLAYERS LONG TERM DEVELOPMENT THROUGH GAME SYSTEM LEARNING**

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### **ABSTRACT**

The subject of this paper are training methodologies important for improving tactics in youth categories of volleyball players. In practice, coaches very quickly switch from learning the 6: 0 system (initial system), to the 5: 1 system (competitive - senior), which for beginners leads to limitations in the manifestation of tactical and strategic skills, but also the effectiveness of technical elements in competition. The aim of this paper is to show the age-oriented, ie chronological and experience-oriented methodology of learning the system in volleyball. Order in training, respect for chronological, motor and sports age, timely specialization and orientation towards the principles of motor learning are recognized as factors leading to the expected outcome in the individual career of an athlete, making training methods effective and desirable in practice.

**Keywords:** VOLLEYBALL / LONG TERM ATHLETE DEVELOPMENT / GAME SYSTEMS / EARLY SPECIALIZATION / SERBIA

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## INTRODUCTION

Sport has become an important part of life, an integral segment in which everyone, from a child to an adult, finds what keeps them involved in sports, whether it is the need to play or the urge to compete (Fratrić, 2015). It is a well-known fact that playing sports from an early age has numerous positive effects in the integral and multilateral development of each individual. Healthy life habits are being created, abilities are being developed, certain knowledge is being learned and skills are being mastered (Gortsila et al., 2013).

Volleyball is a sport that, with its specificity and across the net type of game, has no direct contact with the opponent and it requires top technique, strategy and tactics. It requires a certain movement and motion speed, which attracts all groups of participants and spectators. As a complex sport, volleyball abounds in various motor forms and is defined as a "polystructural complex sport" in which players display technique, tactics, motor skills, all with the aim of achieving certain results and achieving success (Janković and Marelić, 1995). The aspiration for further development of the volleyball game led to certain methods and means of training, as well as to the curriculum of learning and perfecting, which are the basic part of this sports branch (Reid, 2008; Nešić, 2009). Given that volleyball has evolved in recent years in all forms of training, competing and organizing, it can be expected to continue at the same pace in the future. Development challenges bring along serious problems, require different approaches and continuous learning through training (Lenberg, 2006). It is also known as a sport that requires a high level of technical knowledge and tactical intelligence in solving various situations and challenges in the game (Tomić, 1998). For that reason, the path of training that should lead to the achievement of top results, is filled with programmed and planned activities, the establishment of a system and organization of training and competition, timely identification and development of the talented ones to the selection stage. Along the way, the inclusion of professional staff, as well as its preparation for the application of proper and purposeful methods of training and leading the team in the competition, completes the process of a multi-year plan for practicing this sport.

Achieving a high goal in this sport requires a lot of time and quality planning for the development of each of the participants, from players and coaches to leaders and the organization itself. It was determined that in the training itself, the years of practice coincide with the output result (sports experience). The onset of training is at the young age, during a period of intense growth and development filled with continuous exercise control with brief information on performance (Beal, 1987). This information should include explanations, support, encouragement, but also warnings about what has been observed. Motivation by the coach must be present at each individual training (Lazarević, 1987; Baćanac et al., 2009). The essence of the training process in volleyball is expressed to a significant extent in the way coaches treat athletes (Jasinowski, 2010). Establishing clear coach-player relations is essential for quality work in sports, and thus for the careers of both coaches and players.

Long term athlete development (LATD) is a planned, structured and progressive model of directing a sports career through the harmonious development of a young athlete. The goal is to achieve training and competitive success in a timely manner, in the later period, but also to form habits for lifelong, healthy physical activity (Balyi et al. 2013). Such a structured long-term path enables talented young athletes to achieve success at the highest level. LATD implies a comprehensive approach to athlete career development, taking into account motor, morphological, cognitive, psychosocial and many other characteristics of growth and development. This study focuses exclusively on the timely tactical aspects of volleyball players development in accordance with his abilities. In addition, LATD should be

considered a key organizational model in the prevention of chronic diseases (e.g., metabolic syndrome). It is an important instrument for acquiring exercise habits and motivating young people to engage in sports and physical activity (Lloyd et al., 2015). The recommendations of LATD experts for the beginning of specific practising, which will lead to specialization in training, are diverse, with specific gymnastics and swimming training starting at the age of 6-9 (Feeley et al., 2016), while in sports games it starts a little later, at the age of 12-15 years (Bompa, 2000). Early specialization in sports has been found to have a number of side effects, such as a higher risk of injury, overtraining syndrome, and withdrawal from sports (Di Fiori et al., 2014). In addition, daily training loads can result in loss of motivation and lack of concentration in young athletes (DiFiori et al., 2014). Besides the above factors regarding the unadapted training technology, early specialization can negatively affect the athlete and lead to problems in sports development through premature technical adoption, level of preparation, inappropriate tactical variants and game characteristics in an early age. Game systems, as tactical formations and strategies, require, in addition to motor and skill attributes, a certain level of cognitive maturity and concentration. They represent a great burden for young athletes and can be a cause of difficulties in adoption of technical elements. This type of pressure can cause early withdrawal from sports due to the inability to adequately master the high technical and tactical requirements due to unadjusted early specialization (the problem this paper is focusing on).

A review of the literature, as well as a good analysis of existing practice indicate that the reason for the existence of a number of problems in working with young players comes from the untimeliness of learning certain tactical systems. Namely, it was noticed that the training program of a significant number of volleyball coaches does not follow the methods and the necessary patience in working with young athletes. There is a lack of attention dedicated to technical and physical preparation and maturity for continuous learning process through training and competitions. Some of the coaches neglect learning and mastering the game systems (tactics) through training, believing that this part of sports performance comes by itself (Nešić, 2014). Therefore, the aim of this paper is to show to show the age-oriented, ie chronological and experience-oriented methodology of learning the system in volleyball, and thus provide optimal training guidelines, important for mastering tactics in younger categories of volleyball players (subject of the paper).

## **VOLLEYBALL GAME SYSTEMS**

In practical terms, volleyball systems are represented by the arrangement of players on the field and their movement according to a certain setting. Adoption and establishment of a game system requires time, appropriate age, as well as raising volleyball players to the optimal training level, primarily through technical training, tactical knowledge, but also through physical and psychological preparation (Nešić, 2002). In modern volleyball practice in Serbia, it is noticed that many coaches do not go "step by step" with learning the game systems, but tend to prematurely apply systems that, by their nature and complexity, require a previously effectively implemented process of longterm and multilateral development. Such deviations from the training principles of timeliness and optimal development are registered for both genders of athletes. The reason for deviating from the established methodological path should be sought, probably, in the need to compensate for the shortcomings in technique and specific physical preparation. However, technique as a skill, and physical preparation as a system of motor abilities, is not compensated by the applied tactics and vice versa (Tomić, 1989). In other words, with the aim of affirming LATD in volleyball training, deviations from the age, sports and time frame of building an athlete are made, which is consequently manifested during the game. Therefore, as the problem this

paper is focusing on is the inappropriate volleyball practice, ie the inability of young volleyball players to master the high technical and tactical requirements of unadjusted early specialization, in the first step of this problem analysis, it is necessary to point out the stages in chronological development of volleyball game systems (Table 1).

**Table 1.** Game systems development chronology in volleyball

Phase	Game system	System description
I	6:0 – basic system	A combination where all six players set, spike and block (the player who is in zone 3 after the rotation is the setter). This system must be the first to be learned in the game system training and represents a very important period in the development of volleyball players.
II	4:2 initial level	A combination in which two setters stand in the "diagonal" and the one in the front-rowsets. Setter in zone 3
III	4:2 intermediate level	A combination in which two setters stand in the "diagonal" and the one in the front-rowsets. Setter in zone 2
IV	4:2 advanced level	A combination in which two setters stand in the "diagonal" and the one in the back-rowsets. Setter in zone 1
V	5:1	A modern game system with three outside strikers, a middle blocker, a libero and a setter.

In today's volleyball, both at a younger age and at the top level, the game systems listed in Table 1 are used almost exclusively. However, there are several game systems that go beyond everyday practice, and whose creators have tried to, above all, with their originality and tactical unpredictability, produce greater competitive unpredictability. Some of them are (Tomić and Nemec, 1989):

- "3: 3" - a combination in which each spiker has its own setter, ie. setters and spikers form a "triangle".
- "2: 4" - a combination of 4 setters / spikers and two middle blockers, insufficiently tested system, but provides exceptional possibilities.

## TEAM COMPOSITION AND GAME SYSTEMS LEARNING STAGES

In order to understand the game systems learning process, it is necessary to first clarify the specifics of the playing positions in volleyball. Namely, the team composition implies playing positions incorporated in the available twelve players (according to the new rules of the game, 14 players are allowed). The team composition should cover all playing positions in their specialties for modern volleyball tactics, namely: setters, outside hitters, middle blockers, opposites and libero. Coaches should keep in mind that there should be at least one adequate replacement on the bench for each player in the starting team.

The next step in learning the system is the team composition of 12 players playing the 5: 1 system. The most common structure is:

- 2 setters (1 in play - 1 on the bench)
- 3 outside hitters (two in play - 1 on the bench)
- 3 middle blockers (two in play - 1 on the bench)
- 2 opposites (1 in the game - 1 on the bench for reserve players) and
- 2 liberos (there can be only one, and the rules of the game allow him not to be in the team at all. In that case, the number of places for other playing positions increases, most often outside hitters and / or middle blockers, depending on the coach's idea).

This is the most common composition, ie with 12 players, and if there are 14 players (allowed in matches organized by the world-FIVB or European - CEV volleyball organization), then the number of outside hitters and middle blockers increases to 4, while other playing positions usually retain the same number of players as in a 12-player setup. In order to reach this team composition, it is necessary to go through certain stages in technical - tactical training, ie volleyball players must go step by step (Tomić, 1990). Based on the phases from the multi-year structure of the training process, it can be said that the entire process takes place in three steps - stages:

- I. **Initial learning stage** which is of great importance for technique and tactics learning. It can be said that this is a period in training which, in most cases, is crucial for achieving sports mastery. At this stage, the coach is expected to direct the attention of young players to the correct ideas about body motion and technical performance of all movements. The coach applies a purposeful methodological procedure, uses obvious training means and methods of work, including demonstration by the coach himself. This stage is an introduction to the complexity of volleyball, as a game and as a motor activity. Detection and correction of mistakes is extremely important. Also, key constructs about the idea of "physical literacy" (Ropret and Jevtić 2019) are passed on to young athletes, which lead to healthy exercise habits. Moreover, within this phase, the gradual basic volleyball elements training, but also the establishment of an appropriate "base" of motor skills, strengthens the "foundations" for long-term development of the athlete, ie LATD (Balyi, 2001). This stage starts practically from the first training, which in volleyball is usually in the period of 7-10 years (Nešić, 2005) and lasts until the age of 12. In this stage of development, the game system used is 6: 0 in its basic form, but also in simplified variants (with the ball being allowed to drop to the floor between plays, enabling the longer duration of points). Training within this stage is of a general nature ("everyone does everything"), with games as one of the most common tools for training volleyball elements, as well as for improving motor skills.
- II. **The in-depth learning stage**, which is characterized by more detailed multilateral development and learning, and the result of which is motor efficiency that leads to dynamic stereotypes in the performance of motor habits. This stage represents an upgrade of learning through practice and technical-tactical adjustment, with the first signs of individualization visible. It is very important to create a logical sequence of exercises in regard to the principle of gradualness. The choice and sequence of exercises is related to the level of athlete's motor skills, the goal to be achieved and the available time. Adapting the goals and content of training to the windows of trainability of a certain motor abilities of athletes (Canadian sport for life, 2015) is of great importance. If these windows are missed, and content aimed at developing targeted skills and abilities is not applied, the athlete will not be able to reach his or her maximum potential (Balyi & Hamilton, 2004). In that respect, even in this phase, the gradualness of both training exercises and their physiological load, as well as tactical settings, which is a kind of cognitive load for young volleyball players, is important. This stage takes place until the age of 15 for girls and up to 16 for boys, and during which in volleyball, all three levels of the 4: 2 game systems are being taught, with the greatest attention and time being paid to the initial and intermediate level, and the advanced level is applied as preparation for the next stage and for the final system 5: 1. At this age, real specialization begins, in the sense that through the initial level of the 4 : 2 system, the setter stands out for the first time as a playing position, which has the role of passing the balls to the



hitters through three rotations, when he is in the front row. Through the next, intermediate level of the 4 : 2 system, a gradual selection of middle blockers and outside hitters begins, who together with the setter in the front row have a whole range of new technical and tactical knowledge to adopt and through them improve and perfect their performance. The last, advanced level of the 4 : 2 system is an introduction to the 5 : 1 system, since this system (with the previous – intermediate 4 : 2 game system) completes the "setters movement" through all six positions in the field. The training in the stage of in-depth learning is aimed at further improvement of the adopted elements, with a new slightly more complex tactical dimension with the introduction of attacks through the middle, performed by the middle blocker. Motor abilities are further improved, with special attention to critical periods for their development, but also with a focus on abilities that are typical for volleyball, primarily jumping and agility (Nešić et al., 2011).

- III. **Consolidation and further training (sports mastery) stage.** During this stage, permanent and stable motor structures are formed. In the process of training and learning itself, a distinction should be made between the adoption of reshaped and automated movements and motor skills. The reshaping of automated movements goes down to the subconscious level, while further improvement of motor skills requires concentration, planned strategy of action, assessment, as well as correction of errors in performing repetitive movements. This stage takes place from the age of 15 for girls and from the age of 16 for boys and continues throughout the entire athlete's career. The 5: 1 system, as the dominating system in modern volleyball, is almost exclusively represented at the competitive level, both through the younger categories and in the senior stages, and it occupies a dominant place in the stage of further consolidation and improvement. With the specialization, the playing positions are completely selected and the trainings in this stage can be thematically directed towards any of the roles in the team, and also integrated into the volleyball competition with all the tactical variants of attack and defense.

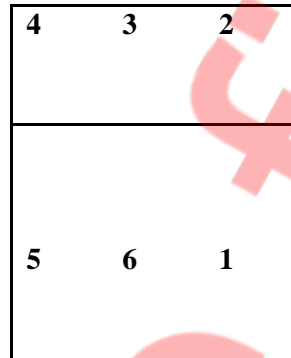
### ORDER OF LEARNING SYSTEMS IN THE VOLLEYBALL GAME

The most significant problem of volleyball training is the adoption of volleyball elements, important for successful performance in volleyball competition (Tomić, 1990). By improving the rules, the development of strategy and tactics also takes place, and thus the system in the game of volleyball. Three touches also enabled the improvement of volleyball elements and game dynamics. Reception is of special importance in the game, followed by the setting of the ball. At the beginning of the development of the game itself, all players performed the function of passing for the spike (setting), but also the function of spiker, receiver and blocker. However, with the volleyball game improvement, there was a division of roles in the team, ie the individual playing positions specialization. This enables the player to be better trained for the playing position specifics and to focus in the roles that each of the listed playing positions implies (Stojanović et al., 2005).

The current direction in volleyball practice in Serbia is marked by early specialization. In the "pursuit" of achieving a competitive result, the settings and principles of training in the function of long-term athletes development (LATD) are neglected. The application of the most efficient means and tactical settings (meant for senior level athletes) that the volleyball game offers is inadequately resorted to. An obvious example of this practice is the fact that already at the initial level of competitions (girls aged 11-12) in many cases there is a 5: 1 system that includes specialized training and strictly targeted training means to meet each of the individual roles in the team. As a result, general development of both technical

elements and motor skills, which will not be possible to compensate at a later age, is neglected (Beunen & Malina, 1996).

The basic precondition for the beginning of the implementation of the methodology of learning a certain game system is a sufficient level of technical knowledge. Technique as a way of performing certain elements of the game, assumes a rational, economical and as natural movement as possible. The number of contacts with the ball perfected the movements within the time for performance of both attack and defense. The order of learning the system is applied according to the principle of gradualness, from easier to harder, simpler to more complex, known to unknown, making the order of learning and introducing children to a certain system very important.



**Scheme 1.**Playing positions in standard court

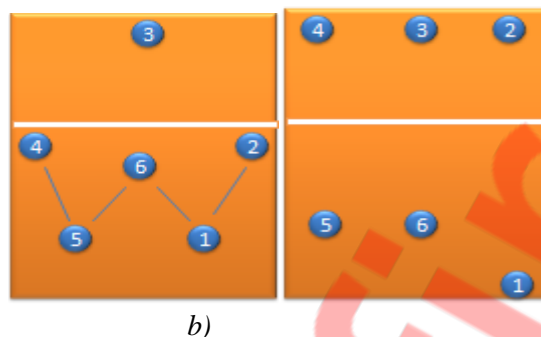
Scheme 1 shows the positions (zones) in the field, and knowledge about them is extremely important, ie it is the first tactical task that future volleyball players should master. Namely, in order for children to learn positions when receiving service (phase 2 - includes all volleyball elements performed by a team, following the service reception, ie receiving service - setting the ball for a spike - attack) and service (phase 1 - includes all elements performed by a team, following the service, ie service - blocking - defense), it is necessary to follow certain rules in positions (eg position 1 must always be to the right of position 6 and behind the position 2, position 4 must be in front of position 5 and to the left of position 3 and so on for each zone).

### **Game system in the first stage of volleyball development (System 6: 0)**

Learning the volleyball game system is closely related to the specialization of the players, so the most recommended system for working with children should be the 6: 0 system. This system is used as a base for first games and a starting point for learning other game systems. In other words, through the 6: 0 system, we teach children positions in the field, rotation, as well as the basic rules and philosophy of the volleyball game.

Describing this system, we can say that it is suitable for working with children, it is simple, it does not require early specialization, ie the content of the program is aimed at the comprehensive development of the individual. It is a system in which everyone plays in all positions and which is as such a system of the future (The advantage of this system is that it demands all players to be at a high level of technical and tactical performance and can play all playing positions equally successfull - D. Tomic). The task in mastering this system is to learn the basic movements within each position and recognize the elements of phases 1 and 2. Each of these phases is characterized by certain tactical problems and specific technical skills that solve these problems. However, the third phase is often forgotten: the transition phase, which, unlike other ball sports, in volleyball is very short and sensitive, and is therefore very

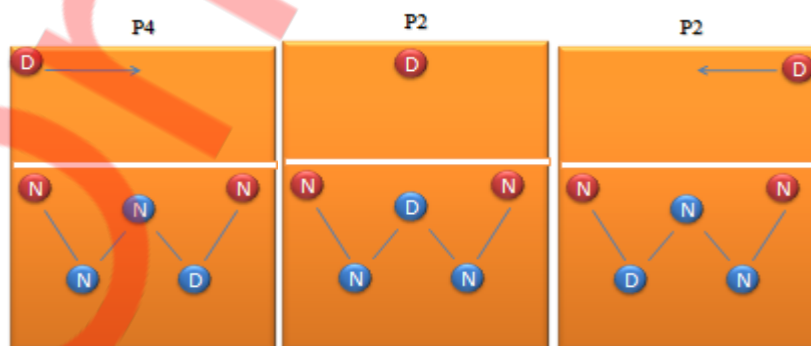
important in the game. Top teams are characterized by a highly efficient and fast transition in the game, which enables more efficient implementation of the attack phase and the defense phase. By learning this game system, volleyball players are already preparing for all future systems.



**Scheme 2.** Players positions in a 6:0 game system (positions during service reception - a; positions during service- b)

### Game system in the second stage of volleyball development (4: 2 system)

In the next game system, which is dominated by young players, which is 4: 2, the team consists of four hitters and two setters that are arranged diagonally. The player setting is such that one of the setter is always in the front row (zones 4, 3 and 2) while the other setter, during that time, is in zones 1, 6 and 5. When the front row setter rotates, he goes to the service (in the position 1), the second setter (its diagonal) comes to the front row. That way, there is always one setter in front row. This is important, because this system and level imply that only the setter that is in the front row sets the ball. According to the nature of the game in this system, the simplest variant with a setter in the middle (in zone 3) is first learned, ie a system that is similar to the previously learned one (6: 0). The difference appears only with the setters entrance from position 4 and position 2, as shown in Scheme 3. All movements in certain settings are practiced first without the ball until mastering the rotations and movements. Ball setting is towards position 4 and position 2, which allows the setter to set the ball both to the front and back (over the head). Of course, at this level of volleyball elements, it is important to use the underhand service (this service is certainly not an adequate attack, but allows the game to develop after the service reception, ie it is possible to complete five elements of the game: service reception – setting the ball for a spike– attack – block – defense). In the case of the overhead-attacking service, at this level of volleyball technique learning, it is certain that it will not be possible to play all the listed elements, that is, most often there is an error in the manifestation of some of them. The overhand service would be a big obstacle in the first steps of mastering the game in 4:2 system, so it should not be applied until the next phase of training.



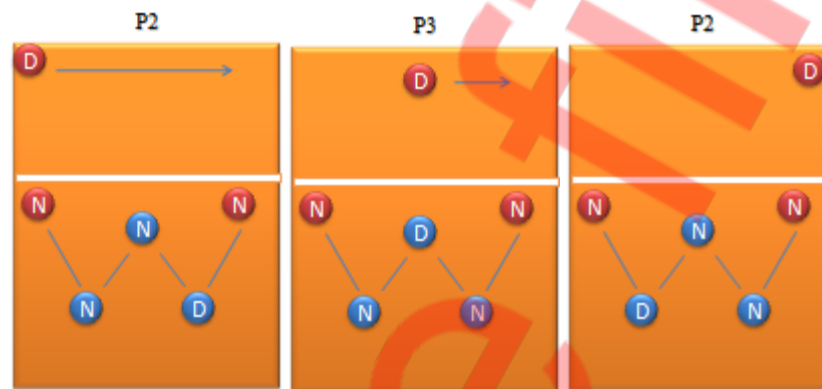
**Scheme 3.** Game system 4:2 – initial level



**Legend:**D – setter, N-spiker

### Game system 4:2 intermediate level (setter in front row, position 2)

The higher level the 4: 2 system is when the setter is located and sets from position 2 (Scheme 4). This means a introduction of the middle blocker in the playing positions specialization. In other words, the setter has the ability to set the ball to position 4, the fast ball to position 3 ("1st tempo") and to the back row to positions 1 and 6. In this way, the setter's actions become more complicated, but also expands the repertoire of his skill and accelerates specialization regarding playing positions. To make mastering this game system easier, underhand service should be used at the beginning, and only later switch to the overhandservice.



**Scheme 4.** Game system 4:2 – intermediate level

### Game system 4:2 advanced level (setter in back row, position 1)

After training the setup and the setter's movement in the front row, you move on to train with the setter's entrance from the back row. The setter can enter from the back row to the net from all three back row positions (positions 1, 6 and 5). After learning the basic variants, it is necessary to show different tactical ideas within the system itself. The value of this system is that a game with two setters has an advantage over a system with one setter. In other words, it is easier to overcome all the challenges of organizing a game with two setters than with one. Another significant advantage of the 4: 2 system, in the younger categories, is in the fact that three attacks from the front row are always possible. The disadvantages of this system are in the lack of good setters in modern volleyball, and especially those who are also good spikers. With the increasing importance of the service, the number of ideal receptions decreases, and thus the need for top spikers is greater. This led to the fact that opposites have are playing a even more significant role in modern volleyball. Hence the next - 5: 1 system appeared.



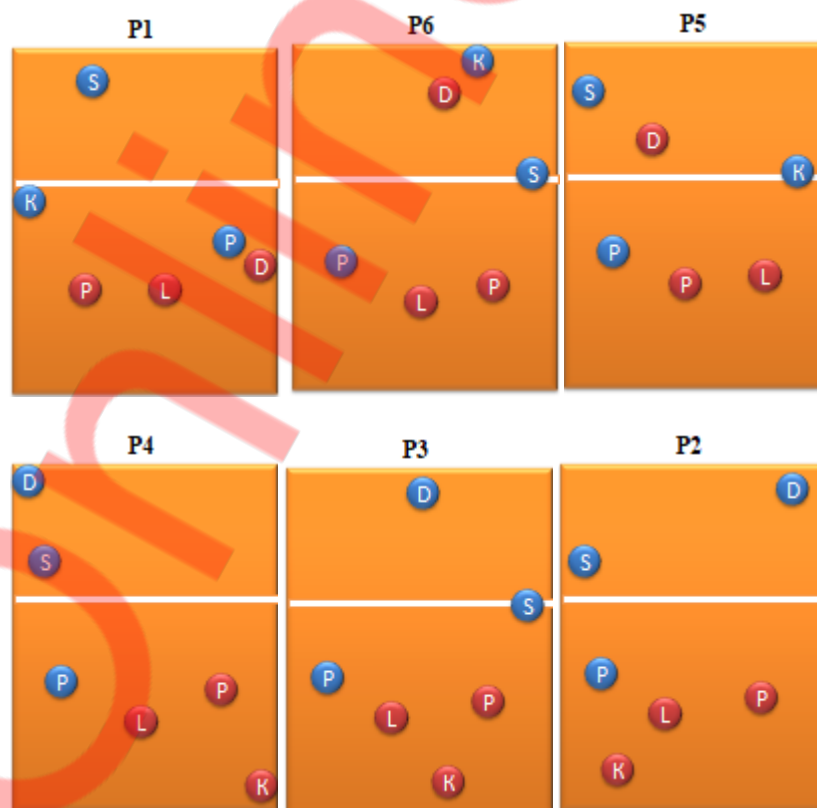
**Scheme 5.**Game system 4:2 – advanced level

**Game system in the third stage of volleyball development (5: 1 system)**

Due to the complexity and necessary focused specialization of players for the 5: 1 game system, the coaches will start as late as possible with the adoption of this system. In modern volleyball, the 5: 1 system prevails, it is characterised by only one setter, who sets the ball both when he is in the front row and in the back row. In addition to the setters in this formation, there are also: three outside hitters, two middle blockers and a libero (Scheme 6).

To facilitate learning of all playing positions in this game system, the following is necessary:

- serve the underhand service to the team which is learning the system,
- serve initially to the receiver who is in the back row. This facilitates and reduces the movement of the setter to the setting zone (between position 2 and 3, with the recent innovations by some coaches in women's volleyball insisting that the reception is passed to the position 3, enabling the middle blocker to attack while jumping of one leg - "fast" ),
- insist on high reception until the spikers and the setter practice their movement and the tempo of entry,
- when the team adopts movement in this position in a facilitated form, gradually modify the situation and introduce the overhand service and demand a faster reception (reducing the time available for the setter to be positioned in the setting zone).
- In the situation when the setter plays the first pass, the setting, if the ball is directed towards the front row, is taken over by the middle blocker or libero if the ball remained in the back row. In a rotation where the setter is in the front row, the ideal reception puts the setter in a position to attack with so-called “dumping”.

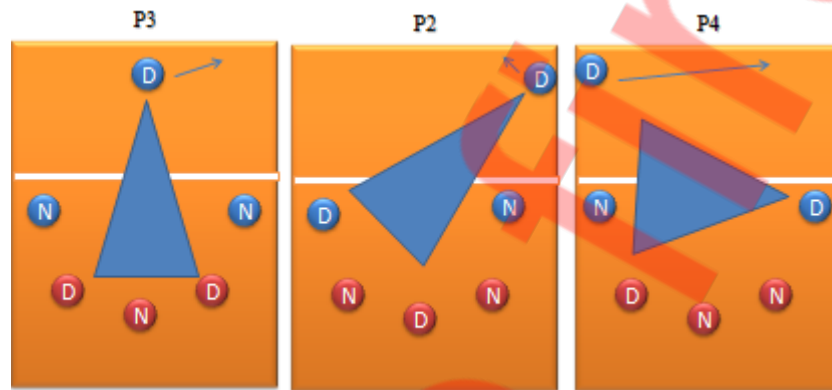


**Scheme 6.**Game system 5:1

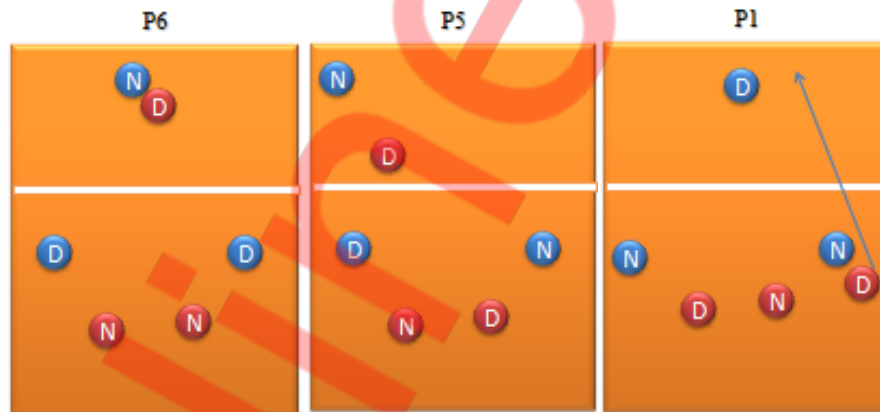
**Legend:**D – setter, P-outside hitter, S- middle blocker, K-opposite, L-libero

**Other volleyball game systems**

Among other volleyball systems, 3: 3 and 2: 4 stand out. As already mentioned, the 3: 3 system is rarely used, although it has its advantages, especially since each attacker "has" his own setter (Scheme 7). This enables a good coordination of these two playing positions and raises efficiency to a higher level. The disadvantage is that it is rare to have 3 setters, which are also capable of attacking.

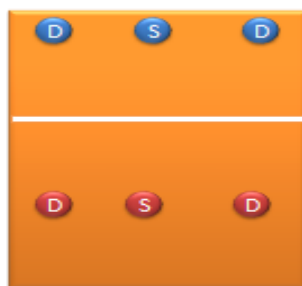


**Scheme 7.**Game system3:3– initial level (front row setter)



**Scheme 8.** Game system3:3– advanced level (back row setter)

The 2: 4 game system implies that the team has 4 universal players and two players in the middle blocker position (Scheme 9). The coach determines which setters do the setting. We will not focus on this system to much, because it is very rarely used. It can be stated that the system was quite efficient, that it has its advantages and that one should know that it exists as a possibility.



**Scheme 9.** Game system 2:4 – four setters and two middle blockers

## CONCLUSION

Coache's and player's knowledge of the game system is one of the prerequisites for a more attractive and quality game, and the choice of system in which a team will play largely depends on the quality of the players of that team. When learning the system in volleyball, one should follow the basic principles of training, and above all gradualness, and be very careful when choosing methods of training. The basic precondition for the beginning of methodical training of a certain system is a satisfactory level of technical knowledge. Mastering the complete technique is the basis for further upgrading and increasing efficiency in the game. We must not lose sight of the fact that it is always possible to create a new, more productive and applicable system. Volleyball as a complex sports game requires constant work and development of science and profession monitoring.

This professional study offers a description of each of the game systems that are more or less represented both in the youth selections and in working with senior categories, which is extremely important for all young coaches and the profession as a whole. The methodological sequence in the volleyball game system training, as well as some of the guidelines for adjusting the youth categories training procedure, can offer new ideas to coaches for training plans and programs in each of the stages of development. The planning of the training process should respect the principles of gradual development of technical, tactical, motor, social and psychological attributes in accordance with each of this segment's stages of development, which leaves room for new research on monitoring long-term changes caused by volleyball training.

Adequate methodological sequence of volleyball game systems adoption would include a systematic approach through the adaptation of national youth categories rules of the game, which would motivate coaches to respect the principles of proper and long-term development of athletes (LTAD). Such adjustments to the rules are no exception, but there is an example in the younger categories of banning the upper service in the Development League (ages 11-12), which directly affects the facilitated conditions for performing all elements that follow the service (reception, lifting, spike ...). Suggestions based on the conclusions of this study would be directed towards mandatory game systems in certain age categories, so in all development leagues for under 12s a 6: 0 system would be mandatory, in order to properly adopt the basic elements of the game, while in the pioneer category ( up to 15 years for girls, up to 16 years for boys) was a mandatory 4: 2 system, which would specialize all volleyball positions from the cadet age, which would be the biological development of the child in line with competitive requirements.

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